



# UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE

United States Patent and Trademark Office

Address: COMMISSIONER FOR PATENTS

P.O. Box 1450

Alexandria, Virginia 22313-1450

www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/549,860	07/13/2006	Nigel P. Smith	NAN155 US	7177
34036 7590 08/24/2009 Silicon Valley Patent Group LLP 18805 Cox Avenue Suite 220 Saratoga, CA 95070				
EXAMINER MIYOSHI, JESSE Y				
ART UNIT		PAPER NUMBER		
2811				
MAIL DATE		DELIVERY MODE		
08/24/2009		PAPER		

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

# Office Action Summary

**Application No.**

10/549,860

**Applicant(s)**

SMITH ET AL.

**Examiner**

JESSE Y. MIYOSHI

**Art Unit**

2811

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 29 April 2009.  
2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.  
3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-21 and 26-30 is/are pending in the application.  
4a) Of the above claim(s) 7 is/are withdrawn from consideration.  
5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.  
6) ☒ Claim(s) 1-6, 8-21 and 26-30 is/are rejected.  
7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.  
8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.  
10) ☒ The drawing(s) filed on 22 September 2005 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).  
11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
a) ☒ All b) ☐ Some \* c) ☐ None of:  
1. ☒ Certified copies of the priority documents have been received.  
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.  
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892)  
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)  
3) ☒ Information Disclosure Statement(s) (PTO/SB/US)  
Paper No(s)/Mail Date 11/9/2007, 6/6/2008, 4/29/2009  
4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date \_\_\_\_\_  
5) ☐ Notice of Informal Patent Application  
6) ☐ Other: \_\_\_\_\_

## **DETAILED ACTION**

### ***Election/Restrictions***

1. Applicant's election without traverse of group I, embodiment 2 as shown in figures 2 and 3 and as recited in claims 1-6, 8-21, 26-30 in the reply filed on 29 April 2009 is acknowledged.
2. Claims 22-25 are withdrawn from further consideration pursuant to 37 CFR 1.142(b) as being drawn to a nonelected group, there being no allowable generic or linking claim. Election was made **without** traverse in the reply filed on 29 April 2009.

### ***Drawings***

3. The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, a first layer and second layer, each which is associated with a first mark portion and a second mark portion must be shown or the feature(s) canceled from the claim(s). No new matter should be entered.

Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate

changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

4. The drawings are objected to under 37 CFR 1.83(a) because they fail to show labels for whap Applicant considers as first and second mark portion, first and second mark section, test zones and pairs of test zones as described in the specification. Any structural detail that is essential for a proper understanding of the disclosed invention should be shown in the drawing. MPEP § 608.02(d). Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each

drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

### ***Specification***

5. The disclosure is objected to because of the following informalities: on page 10, line 18 and line 21 uses "axis" and "axes". The two words are interchanged throughout the specification and should be uniformly written, appropriate correction is required.

### ***Claim Objections***

6. Claims 5, 10, 16, 27-29 are objected to because of the following informalities:
7. Claims 5, 28 and 29 uses the term "axes" while claim 2 uses "axis", Examiner requests the use of a uniform term.
8. Claims 10 and 27 uses the term "centres", please change to "centers".
9. Claim 16 should recite "the elongate rectangular mark structure"
10. Appropriate correction is required.

### ***Claim Rejections - 35 USC § 112***

11. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the

art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

12. Claims 28 and 29 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. As described in claim 28, never previously claimed or described is "...and **long axes** of the rectangular mark structures of the first mark section and the second mark structures are co-linear within each test zone...".

13. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

14. Claim 5, 9 and 28 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

15. Claim 5 recites the limitation "the rectangular directions" and "the mirror axes of the imaging equipment" in lines 2 and 3 of claim 5. There is insufficient antecedent basis for this limitation in the claim. Examiner is assuming "imaging axis of the imaging apparatus" was to be in the place of "mirror axes of the imaging equipment".

16. Claim 9 recites "a single such pair disposed in a first direction and a single such pair in a second direction". This claim is indefinite because it is impossible for "a single such pair" be disposed in one direction AND a second direction.

17. Claim 28 recites the limitation "long axes" in line 10 of claim 28 and "the second mark structures" in line 11 of claim 28. There is insufficient antecedent basis for this limitation in the claim. For examination purposes, Examiner is assuming said recitation of "long axes" as "a long axes". Said limitation was not previously defined in the claims or the specification. "the second mark structure" will be examined as "mark structures in the second mark section"

***Claim Rejections - 35 USC § 102***

18. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

19. Claims 1-6, 8-11, 16, 17, 19, 21, 26 and 27 are rejected under 35 U.S.C. 102(b) as being anticipated by Hsu (U.S. 6,083,807).

**Re claim 1:** Hsu teaches (e.g. figure 6) an overlay metrology mark for determining the relative position between two or more layers of an integrated circuit structure comprising a first mark portion (**61, 62, 63, 64**) associated with a first layer (first layer; e.g. abstract) and a second mark portion (**65, 66, 67, 68**) associated with a

second layer (second layer; e.g. abstract), wherein the first (61, 62, 63, 64) and second (65, 66, 67, 68) mark portions together constitute, when the mark is properly aligned, at least one pair of test zones (61 and 65 paired with 62 and 66 OR 63 and 67 paired with 64 and 68), each test zone (61 and 65, 62 and 66, 63 and 67, 64 and 68) comprising a first mark section (61, 62, 63 or 64) formed as part of the first mark portion and a second mark section (65, 66, 67 or 68) formed as part of the second mark portion each comprising a plurality of elongate rectangular mark structures of equal length and in parallel array (each of the mark structures of the second mark portion are each rectangular and of the same length and are in parallel pairs 65 and 66 or 67 and 68) adjacently disposed to form the said test zone (61 and 65, 62 and 66, 63 and 67, 64 and 68) such that the mark structures in each test zone are in alignment in a first direction (the direction parallel to the elongate direction of 65) within the test zone but are substantially at 90° with respect to the mark structures of at least one other test zone in alignment in a second direction (the direction parallel to the elongate direction of 67), and wherein the test zones (61 and 65, 62 and 66, 63 and 67, 64 and 68) making up the at least one pair of test zones (61 and 65 paired with 62 and 66) are laterally displaced relative to each other along one of the said directions.

**Re claim 2:** Hsu teaches an overlay metrology mark wherein the mark structures in each test zone (61 and 65, 62 and 66, 63 and 67, 64 and 68) are laterally disposed relative to each other such as in use to have mirror symmetry about an imaging axis (middle point equidistant from 65, 66, 67, 68) of the imaging apparatus.



**Re claim 3:** Hsu teaches an overlay metrology mark wherein each mark portion is developed within or on the said layer (first layer or second layer as discussed in the abstract of Hsu).

**Re claim 4:** Hsu teaches an overlay metrology mark wherein each mark portion is printed on the said layer by a microlithographic process (photolithographically producing each layer; e.g. column 1, line 17).

**Re claim 5:** Hsu teaches an overlay metrology mark wherein each test zone (61 and 65, 62 and 66, 63 and 67, 64 and 68) has a generally square or rectangular outline shape, the rectangular directions corresponding to the said first and second directions and to the mirror axes of the imaging equipment in use (middle point equidistant from 65, 66, 67, 68).

**Re claim 6:** Hsu teaches an overlay metrology mark wherein test zones (61 and 65, 62 and 66, 63 and 67, 64 and 68) are generally square (each test zone is generally square).

**Re claim 8:** Hsu teaches an overlay metrology mark comprising more than one pair of test zones (61 and 65 paired with 62 and 66 is "pair 1" and 63 and 67 paired with 64 and 68 is "pair 2"), wherein each pair is laterally disposed equidistantly about a common centre (middle point equidistant from 65, 66, 67, 68) in one or other of the said two directions.

**Re claim 9:** Hsu teaches an overlay metrology mark comprising a single such pair (pair 1) disposed in a first direction (vertically) and a single such pair (Pair 2) in a second direction (horizontally).

**Re claim 10:** Hsu teaches an overlay metrology mark wherein the first (61, 62, 63 or 64) and second (65, 66, 67 or 68) mark sections of each zone (61 and 65, 62 and 66, 63 and 67, 64 and 68) comprise closely adjacent mark structures in parallel array in a common direction, respectively part of the first mark portion (61, 62, 63, 64) and the second mark portion (65, 66, 67, 68), and wherein the first (61, 62) and second (65, 66) mark sections of two zones (pair 1) are in the first direction (vertically) and the first (63, 64) and second (67, 68) mark sections of the other two zones (pair 2) in similar arrays but disposed at right angles thereto, and the two test zones in each pair (pair 1 and pair 2) are laterally spaced in respectively an X and Y direction about common centres (middle point equidistant from 65, 66, 67, 68).

**Re claim 11:** Hsu teaches an overlay metrology mark wherein the elongate rectangular mark structures comprise single monolithic rectangular structures (61, 62, 63, 64, 65, 66, 67, 68 are all monolithic rectangular structures).

**Re claim 16:** Hsu teaches an overlay metrology mark wherein the pitch of the elongate rectangular structures is of constant period in each mark section (all marks are disposed vertically or horizontally since the definition of "pitch" can mean a specified downward slant).

**Re claim 17:** Hsu teaches an overlay metrology mark wherein the period is identical in all mark sections (all marks are disposed vertically or horizontally).

**Re claim 19:** Hsu teaches an overlay metrology mark wherein each test structure has a width of around 0.5 to 2  $\mu\text{m}$  (0.3  $\mu\text{m}$ ; e.g. column 3, line 49), and wherein spacing

between test structures in the array is between 1/2 and two structure widths (distance between is about 0.2 to 0.3  $\mu\text{m}$ ; e.g. column 3, line 65).

**Re claim 21:** Hsu teaches a method for providing an overlay metrology mark to determine the relative position between two or more layers of an integrated circuit structure comprises the steps of: laying down a first mark portion (form first mark on first layer; e.g. column 3, line 3) in association with a first layer; and laying down a second mark portion (forming a second mark one a second layer on said first layer; e.g. column 3, lines 6-7) in association with a second layer; the first (**61, 62, 63, 64**) and second (**65, 66, 67, 68**) mark portions being so structured as to together constitute, when the mark is properly aligned, at least one pair of test zones (**61** and **65** paired with **62** and **66** OR **63** and **67** paired with **64** and **68**), each test zone (**61** and **65**, **62** and **66**, **63** and **67**, **64** and **68**) comprising a first mark section (**61, 62, 63** or **64**) formed as part of the first mark portion (**61, 62, 63, 64**) and a second mark section (**65, 66, 67** or **68**) formed as part of the second mark portion (**65, 66, 67, 68**) each comprising a plurality of elongate rectangular mark structures of equal length and in parallel array (each of the mark structures of the second mark portion are each rectangular and of the same length and are in parallel pairs **65** and **66** or **67** and **68**) adjacently disposed to form the said test zone (**61** and **65**, **62** and **66**, **63** and **67**, **64** and **68**) such that the mark structures in each test zone are in alignment within the test zone, said alignment being in a first direction (the direction parallel to the elongate direction of **65**) in half of the test zones and in a second direction (the direction parallel to the elongate direction of **67**) substantially at 90° thereto in the other test zones, and wherein the test zones (**61** and

**65, 62 and 66, 63 and 67, 64 and 68)** making up the at least one pair of test zones (**61 and 65** paired with **62 and 66**) are laterally displaced relative to each other along one of the said directions.

**Re claim 26:** Hsu teaches the method, wherein the first (**61, 62, 63, 64**) and second (**65, 66, 67, 68**) mark portions are so structured as to together constitute, when the mark is properly aligned, more than one pair of test zones (**61 and 65** paired with **62 and 66** OR **63 and 67** paired with **64 and 68**), wherein each pair is laterally disposed equidistantly about a common centre (middle point equidistant from **65, 66, 67, 68**) in one or other of the said two directions.

**Re claim 27:** Hsu teaches the method, wherein the first (**61, 62, 63 or 64**) and second (**65, 66, 67 or 68**) mark sections of each zone (**61 and 65, 62 and 66, 63 and 67, 64 and 68**) comprise closely adjacent mark structures in parallel array in a common direction, respectively part of the first mark portion (**61, 62, 63, 64**) and the second mark portion (**65, 66, 67, 68**), and wherein the first (**61, 62**) and second (**65, 66**) mark sections of two zones (**61 and 65** paired with **62 and 66** is "pair 1") are in the first direction (vertically) and the first (**63, 64**) and second (**67, 68**) mark sections of the other two zones (**63 and 67** paired with **64 and 68** is "pair 2") in similar arrays but disposed at right angles thereto, and the two test zones (pair 1 and pair 2) in each pair are laterally spaced in respectively an X and Y direction about common centres (middle point equidistant from **65, 66, 67, 68**).

20. Claims 1, 16, 18, 28-30 are rejected under 35 U.S.C. 102(e) as being anticipated by Lan (U.S. 7,136,520).

**Re claim 1:** Lan teaches (e.g. figure 2D) an overlay metrology mark for determining the relative position between two or more layers of an integrated circuit structure comprising a first mark portion (**110a**, **110b**) associated with a first layer (first semiconductor layer; e.g. abstract) and a second mark portion (**220**) associated with a second layer (second semiconductor layer; e.g. abstract), wherein the first (**110a**, **110b**) and second (**220**) mark portions together constitute, when the mark is properly aligned, at least one pair of test zones (**110a** and **110b** form pair 1 and two **220** form pair 2), each test zone comprising a first mark section (**110a** or **110b**) formed as part of the first mark portion (**110a**, **110b**) and a second mark section (left **220** or right **220**) formed as part of the second mark portion (**220**) each comprising a plurality of elongate rectangular mark structures of equal length and in parallel array adjacently disposed (all of **110a**, **110b** and **220** are equal length and parallel array) to form the said test zone (**110a** and **110b** form pair 1 and two **220** form pair 2) such that the mark structures in each test zone are in alignment in a first direction (horizontal) within the test zone (**110a**, **110b**) but are substantially at 90° with respect to the mark structures of at least one other test zone (**220**) in alignment in a second direction (vertical), and wherein the test zones (**110a**, **110b**) making up the at least one pair of test zones are laterally displaced relative to each other along one of the said directions (**110a** and **110b** are displaced along the vertical direction).

**Re claim 16:** Lan teaches an overlay metrology mark wherein the pitch of the elongate rectangular structures is of constant period in each mark section (see figure 2D).

**Re claim 18:** Lan teaches an overlay metrology mark wherein all rectangular test structures (**110a**, **110b**, **220**) in a test zone have identical widths and spacing.

**Re claim 28:** Lan teaches (e.g. figure 2D) an overlay metrology mark for determining the relative position between two or more layers of an integrated circuit structure, the overlay metrology mark comprising at least a pair of test zones (**110a**, **110b**), the test zones (**110a**, **110b**, **220**) being laterally displaced relative to each other, each test zone (**110a**, **110b**, **220**) comprising a first mark section (**110a**, **110b**) formed on a first layer (first semiconductor layer; e.g. abstract) of the integrated circuit structure and a second mark section (**220**) formed on a second layer (second semiconductor layer; e.g. abstract) of the integrated circuit structure, the second layer being disposed over the first layer (see abstract), each of the mark sections comprising a plurality of parallel array of elongate rectangular mark structures of equal length (**110a** and **110b**; left **220** and right **220**), wherein when the overlay metrology mark is properly aligned the mark structures in the first mark section (**110a**, **110b**) are parallel to and adjacently disposed to the mark structures in the second mark section (**220**) and long axes of the rectangular mark structures of the first mark section (**110a**, **110b**) and the second mark structures (**220**) are co-linear within each test zone and are perpendicular with respect to the other test zone.

**Re claim 29:** Hsu teaches the overlay metrology mark, comprising four test zones (**110a**, **110b**, left **220**, and right **220**), wherein the long axes of the rectangular mark structures of the first mark section (**110a**, **110b**) and the second mark structures (**220**) are co-linear along a first direction (horizontal direction) in a first test zone (**110a**) and a second test zone (right **220**) and are co-linear along a second orthogonal direction (vertical direction) in a third test zone (**110b**) and a fourth test zone (left **220**).

**Re claim 30:** Hsu teaches the overlay metrology mark, comprising four test zones (**110a**, **110b**, left **220**, and right **220**), wherein a first test zone (**110a**) and a second test zone (**110b**) are aligned on an axis along a first direction (vertical direction) and are separated by a distance that is approximately equal to a total length of the rectangular mark structures in both the first mark section (**110a**, **110b**) and the second mark section (**220**) of a third test zone (left **220**), and wherein the third test zone (left **220**) and a fourth test zone (right **220**) are aligned on an axis along a second direction (horizontal direction) that is orthogonal to the first direction (vertical direction) and are separated by a distance that is approximately equal to a total length of the rectangular mark structures in both the first mark section (**110a**, **110b**) and the second mark section (**220**) of the first test zone (**110a**).

***Claim Rejections - 35 USC § 103***

21. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the

invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

22. Claims 12-15 and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hsu as applied to claim 8 above, and further in view of Ballarin (U.S. 6,876,092).

**Re claim 12:** Hsu is silent as to an overlay metrology mark wherein the elongate rectangular mark structures comprise arrangements of substructures constituting together a general elongate rectangular outline.

Ballarin teaches (e.g. figure 2) an overlay metrology mark wherein the elongate rectangular mark structures (3) comprise arrangements of substructures (23, 25) constituting together a general elongate rectangular outline (3).

It would have been obvious to one of ordinary skill in the art at the time of the invention to use the teachings of Ballarin in the device of Hsu in order to enable a more accurate measure of overlay errors (see column 7, lines 52-53 of Ballarin).

**Re claim 13:** Hsu modified by Ballarin teaches overlay metrology mark wherein the elongate rectangular mark structures (3) comprises a row or column as the case may be of smaller constituent test structures (23, 25), for example a row or column of squares.

**Re claim 14:** Hsu modified by Ballarin teaches an overlay metrology mark wherein each elongate rectangular test structure (3) and/or each constituent test structure comprise arrangements of design rule sized sub-structures (23, 25).

**Re claim 15:** Hsu modified by Ballarin teaches an overlay metrology mark wherein the arrangements of design rule sized sub-structures (23, 25) are selected from parallel arrays of elongate rectangular sub-structures in either direction, arrays of



square sub-structures (**23, 25**), circles in square or hexagonal array, arrays of holes within a suitably shaped test structure and any combinations of these or other like patterns.

**Re claim 20:** Hsu modified by Ballarin teaches an overlay metrology mark wherein each mark section (**P<sub>1</sub>**) comprises at least five test structures (**3**) in each direction.

### ***Conclusion***

23. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. U.S. 4,981,529 to Tsujita, U.S. 7,096,127 to Ziger et al., U.S. 6,172,409 to Zhou, U.S. 6,803,668 to Holloway et al. and U.S. 5,525,840 to Tominaga all disclose aligning patterns having arrays of rectangular shapes.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to JESSE Y. MIYOSHI whose telephone number is (571)270-1629. The examiner can normally be reached on M-F 7:30AM-5:00PM EST. Alternating Fridays off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Lynne A. Gurley can be reached on (571) 272-1670. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Jesse Miyoshi/

/Ori Nadav/

Primary Examiner, Art Unit 2811